U.S. Army TRADOC Analysis Center
Naval Postgraduate School
Monterey, CA 93943

TRAC-MONTEREY

FISCAL YEAR 2001 RESEARCH PLAN

for the

U.S. ARMY TRADOC ANALYSIS CENTER MONTEREY

*Center for
Advanced Simulation Research*

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I. ADVANCED SIMULATION RESEARCH CENTER

TRAC-Monterey Mission

TRAC-Monterey is the Center for Advanced Simulation Research. It provides a full-time analytical capability to the U.S. Army Training and Doctrine Command (TRADOC) Analysis Center (TRAC) and serves as TRAC's principle research activity. TRAC-Monterey performs the following functions:

- Research in two major areas: (1) leading-edge computer simulation concepts and advanced technologies for modeling military operations focusing on system interoperability; and (2) practical, real-world military operations research problems.
- Support to the Naval Postgraduate School (NPS). Support includes applicable and professionally enriching military oriented 'experience tours,' course projects and Master's thesis topics for officers from all branches of service and all nations attending NPS.
- Strong outreach program that maintains close ties with TRAC and various Army and Department of Defense commands and agencies through collaborative research partnerships.

TRAC-Monterey's two major research thrusts, leading-edge computer simulation research and real-world military operations research problems, ensure the Center remains relevant and closely linked with the Army. TRAC-Monterey possesses significant experience linking simulations using Distributed Interactive Simulation (DIS) protocols and the High Level Architecture (HLA). TRAC-Monterey analysts also have core competencies in simulation development, re-engineering legacy simulations and simulation systems architectures. TRAC-Monterey analysts regularly brief findings of advanced simulation research at DoD-sponsored workshops and international conferences.

NPS supports the Center's research initiatives with world-class faculty and students. TRAC-Monterey's research program offers NPS faculty a broad range of opportunities for studying challenging, applied problems that support NPS curricula and enhancing professional development. The Center's research program supports students from all branches of military service and allied officers with opportunities to investigate a wide range of interdisciplinary issues. TRAC's research program is particularly well suited to military officers who wish to apply operations research, applied mathematics, engineering, and computer science concepts studied in the classroom to real-world military problems.

Organization and Facilities

TRAC Headquarters is located at Fort Leavenworth, Kansas. TRAC-Monterey is one of four analysis centers organized under TRAC Headquarters. The other centers shown in Figure 1 are TRAC-Fort Leavenworth, Kansas, TRAC-White Sands Missile Range, New Mexico, and TRAC-Fort Lee, Virginia.

TRAC-Monterey is located on the grounds of the Naval Postgraduate School, Monterey, California, and occupies office and laboratory space on the second and third floors of Building 203. Facilities on the second floor include offices for the director, analysts, administrative personnel, and a conference room. The third floor consists of a combat simulation laboratory, contractor and student work areas, and a meeting room. The Center maintains a modern network of computers and peripherals.

Figure 1. U.S. Army TRADOC Analysis Center (TRAC) Sites
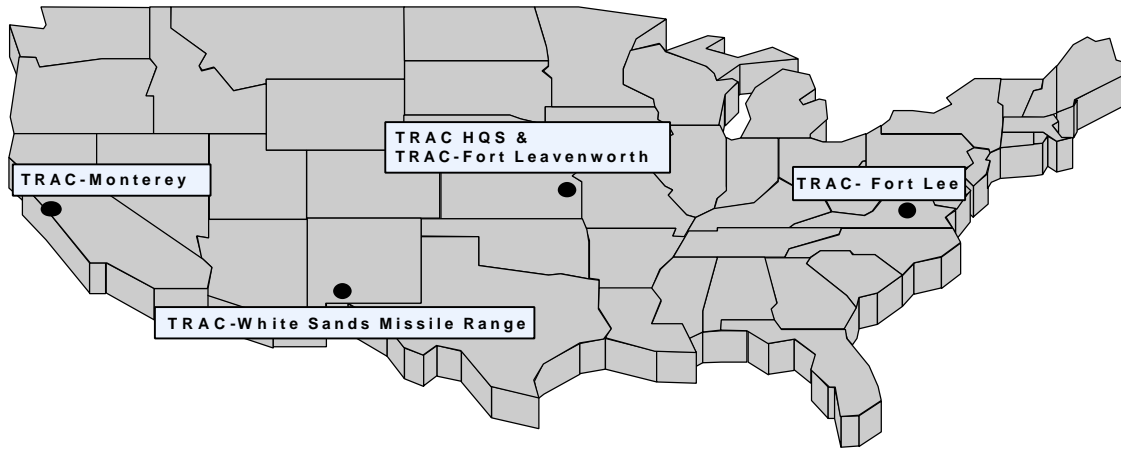
Personnel

The TRAC-Monterey Table of Distribution and Allowances (TDA) authorizes a director (O5), five military operations research analysts (O4/O3), and an administrative staff. Table 1 lists the TRAC-Monterey Analysts at the start of this fiscal year.

Table 1. TRAC-Monterey Analysts

POSITION	NAME	PHONE	EMAIL
Director	LTC Jeffrey A. Appleget, Ph.D.	DSN 878-3088	applegetj@trac.nps.navy.mil
Analyst	MAJ LeRoy A. Jackson, M.Sc.	DSN 878-4061	jacksonl@trac.nps.navy.mil
Analyst	MAJ Theodore D. Dugone, M.Sc.	DSN 878-4057	dugonet@trac.nps.navy.mil
Analyst	MAJ James E. Illingworth, M.Sc.	DSN 878-4060	illingwj@trac.nps.navy.mil
Analyst	CPT Scott T. Crino, M.Sc.	DSN 878-4062	crinos@trac.nps.navy.mil

TRAC-Monterey analysts identify research opportunities, write research proposals, solicit funding and support, write statements of work for contractor and professor support, collaborate with professors, students and contractors, and lead small research and development teams.

TRAC-Monterey augments its organic research capability in various ways. A major source of support comes from NPS faculty members who conduct TRAC-sponsored research. A second source is NPS Masters students who work on TRAC-sponsored projects and who are advised by NPS faculty and TRAC-Monterey analysts. TRAC-Monterey also partners with other TRAC centers and other government organizations. Finally, private contractors provide software development support and assistance with proof-of-principle demonstrations.

The Research Council plans and directs TRAC-Monterey's research. The council consists of the director, assigned analysts, and selected members of the NPS faculty. This year the Research Council includes three faculty members: Dr. Tom Lucas, Associate Professor and member of the Army Operations Research/Systems Analysis (ORSA) Advisory Committee, LTC Gene Paulo, Assistant Professor, and LTC Joel Parker, Military Instructor.

II.   RESEARCH PLAN

Purpose

The Research Plan formalizes TRAC-Monterey's research and problem-solving activities for the upcoming fiscal year. The plan provides a concise summary of each applied research project undertaken by TRAC-Monterey. The summaries include the title, clients, executive summary, background, problem description technical approach, milestones, deliverables, research team, and references. The plan also serves as a means of announcing TRAC-Monterey's planned research activities to other TRAC offices, NPS faculty and students, and various agencies throughout DoD.

The Research Plan is divided into two main categories: funded and unfunded. The TRAC-Monterey Research Council approved all projects, funded and unfunded, as viable and applicable research endeavors. TRAC-Monterey will complete unfunded projects if required funds become available during the fiscal year. In certain cases, the TRAC-Monterey director may determine that an unfunded project has high payoff value and direct an analyst to initiate the project with available resources.

Annual Research Cycle

TRAC-Monterey's Annual Research Cycle begins in October and continues through the middle of October the following year. The major phases of the research cycle are illustrated in Figure 2. The white bands depict the time periods and major tasks for each phase. The research cycle begins by identifying potential research projects for the upcoming fiscal year. Potential projects include new and continuing projects from the previous year. During this phase TRAC-Monterey analysts prepare research proposals for potential projects. In the second phase, the TRAC-Monterey Research Council reviews each project proposal.

The Council assesses the project's potential value to the Army and its contribution to TRAC-Monterey's major research thrusts. The Council also determines whether faculty or contractor support is necessary to complete required tasks and if funding is available for the support. Finally, TRAC-Monterey publishes the Annual Research Plan and begins research for the fiscal year. Publication of the Center's Annual Research Report completes the annual research cycle. The Annual Research Report summarizes research accomplished during the previous year.

Figure 2. TRAC-Monterey Research Cycle
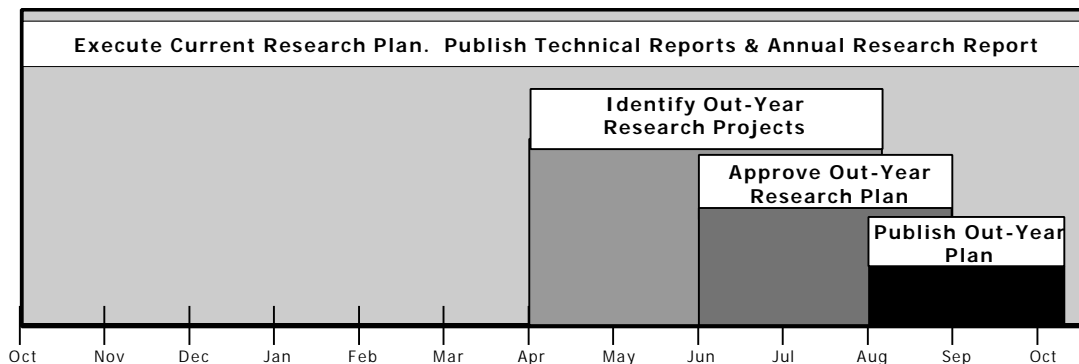
III.   RESEARCH FOCUS

TRAC-Monterey will focus its primary effort on research projects that support the Army transformation directly and indirectly. Of immediate interest is modeling military operations in complex and urban terrain. Below are two important unfunded emerging research efforts that support this focus.

INTEGRATION OF URBAN CHARACTERIZATION, MUNITIONS EFFECTS, AND THREAT ASSESSMENT FOR MOVEMENT PLANNING IN URBAN ENVIRONMENTS

This project will support Computer Generated Forces (CGF) development and will focus on incorporation into OneSAF through the COMBAT XXI platform. OneSAF and COMBAT XXI will be used in the future to support operational analysis of the Future Combat System (FCS) and to train the Objective Force. Potential also exists for incorporation of these algorithms into decision making tools for command and control. Algorithms will be developed for characterizing urban footprints, assessing structural damage including rubble in urban terrain subjected to conventional weapons attack, and determining routes through the urban environment with consideration for engineer effort required to remove obstructions and risks posed by potential threat forces. This research will accelerate Army M&S efforts in focus areas for logistics, cognitive modeling, and MOUT (Military Operations in Urban Terrain) by producing algorithms that incorporate factors for cognition with regard to logistics (route assessment/planning). Algorithms for damage assessment of different types of structures subjected to a typical threat weapon data set will be established using structural response calculations and experimental and historical data. Probabilistic algorithms will be explored for quantifying rubble based on structural response to weapons effects.

NON-LETHAL MODELING ASSESSMENT AND DEVELOPMENT

This project will synthesize knowledge about non-lethal weapons and mechanisms, identify knowledge and data gaps, and develop conceptual models to represent non-lethal weapons effects against personnel and material targets in combat simulations. The advances in technology for military weapon systems allow commanders to utilize alternative approaches toward mission accomplishment at the strategic, operational and tactical levels. Recent experiences in Somalia, Bosnia, Rwanda, Haiti and Kosovo represent the military's shift toward more stability and support operations (SASO), where the use of non-lethals is vital in conducting crowd control during peacekeeping and humanitarian assistance missions. The use of non-lethal weapons is not restricted to SASO, however. TRADOC pamphlet 525-73, Concept for Non-Lethal Capabilities in Army Operations, outlines the concept for the use of non-lethal weapons in interdiction of tactical/strategic resources, conflict intervention, counterdrug/terrorist operations, hostage retrieval and military operations in urban terrain (MOUT), as well as, large-scale operations. The Army must train for the use of non-lethals on the battlefield and capabilities should be incorporated into all appropriate battle simulations. The question of how to model non-lethal weapons effects and human behaviors toward those weapons still remains. How do we develop algorithms to accurately represent weapons effects on a person or group of people, regardless of religion, color, creed or ethnic background? Readiness of the US Army directly ties to the ability to model and simulate current technologies for use in a training environment.

IV. FUNDED RESEARCH

Standard Data Exchange for M&S Data Using XML (XML Data Stds)

Project FY01-01-01

Client

Director, Army Modeling & Simulation Office (AMSO)
Data Standards Category
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Army Material Systems Analysis Activity (AMSAA), Aberdeen Proving Ground, MD 21005
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Executive Summary

Authoritative data providers (e.g., AMSAA and NGIC) currently provide data to M&S customers in various formats and by various means. The lack of standard methods for interchanging data between data producers and consumers results in extensive data manipulation and delays in the application of the data. This effort will solve that problem using extensible Markup Language (XML) by developing a standard methodology for the exchange of sample set of equipment characteristics and performance (C&P) data between producers of Blue and Threat data and a sample set of customers.

Background

Data providers currently export data in formats convenient to them rather than the consumers or are forced to export data in multiple formats tailored to specific simulation applications. In the first case, multiple consumers must reformat the data; in the second the producer must reformat the data multiple times. By providing data in a standard format, each provider requires only one set of routines to provide an external view of the data regardless of the user and each user requires only one set of routines to import the data regardless of the provider. Development of a standard toolset and methodology for delivery of C&P data to users in a common format supports automated delivery of data to all M&S domains as well as to other consumers of C&P data.

This project will promote data sharing and reuse across simulations and their supporting applications, reduce requirements for custom code needed for data import and export, accommodate changes to both producer and user databases without additional costs, and support emerging simulations with application of data standards. The project also reduces resources currently required for acquisition and reformatting of data to satisfy multiple customer format requirements.

The key underlying technology for our effort is the eXtensible Markup Language (XML) and associated standards including the XML Style Language (XSL). XML and XSL are standardized by the World Wide Web consortium (W3C). The maturity of XML standards is evidenced by the adoption of XML by a wide variety of applications and by vendors including Microsoft, IBM, and Oracle.

The results of our literature search indicate that several Army research efforts have successfully demonstrated the use of XML for interchanging other types of simulation data. However, this project is focused on developing XML standards for C&P data specifically.

Problem Description

This project will focus on developing and demonstrating the use of XML data standards for interchanging C&P data. Data requirements will be developed to describe the sample consumers' data needs. These requirements will drive the development of XML standards. The standards will be used with sample data to demonstrate the flow of data from producers to consuming simulation applications.

This project has the potential to provide significant savings in time and money associated with providing data to M&S applications. The actual savings will depend upon the adoption of the XML standards by producers and consumers of C&P data. Army transformation to the Objective Force requires intensive use of M&S across all three domains. Improved methods and standards for sharing data will improve the results of the application of M&S by facilitating the delivery of data from authoritative data sources.

Technical Approach

The overall approach is as follows:
- Define the C&P data requirements for COMBAT XXI and OTB.
- Inventory AMSAA and NGIC C&P data sources.
- Perform a gap analysis to identify any unsupported data requirements.
- Document existing (i.e., NGIC, AMSAA) database schemas.
- Develop XML DTDs to support the data interchange.
- Generate unclassified samples of the data that comply with XML DTDs.
- Demonstrate the translation of sample data into formats required by COMBAT XXI and OTB.
- Demonstrate access to the sample data using COTS, COMBAT XXI, and OTB applications.
- Document the developed standards, recommended methodology, and metrics.
- Support efforts to harvest XML C&P data standards into the SNAP/ASTARS process.

Our XML solution supports the collaborative development of open non-proprietary industry-supported standards. Unsatisfactory competing approaches would force reliance on proprietary data formats and vendor-specific solutions.

Milestones

- Requirements Specification (3 Months After Start)
- Data Inventory (3 Months After Start)
- Gap Analysis Report (3 Months After Start)
- Data Schema Documentation (6 Months After Start)
- XML DTDs, Schemas (9 Months After Start)
- IPR to AMSO Director/Tech Advisor (9 Months After Start)
- Sample Data (9 Months After Start)
- Combat XXI and OTB Format (12 Months After Start)
- Demonstration (12 Months After Start)
- Documented Standards (12 Months After Start)
- Outbrief of Project Results/Product (12 Months After Start)
- Document Research in Technical Report (12 Months After Start)

Deliverables

- Data Analysis and Requirements Report
- Data Sharing Mechanism Report

- Final Technical Report

Research Team
- MAJ Tedd Dugone, TRAC-Monterey (lead)
- MAJ Leroy Jackson, TRAC-Monterey

References

- Lacy, L., T. Dugone, and G. Stone, "XML Data Interchange Format Standards for HLA-Related Data Interoperability", Proceedings of the Southeastern Simulation Conference, July 1999.
- Lacy, L., T. Dugone, and G. Stone, "Sharing HLA Scenario Data". Proceedings of the Fall '99 Simulation Interoperability Workshop, September 1999.
- Lacy, L., T. Dugone, and G. Stone, "High Level Architecture (HLA) Dynamic Scenario Builder (DSB) Technical Report", September 1999.
- Lacy, L., T. Dugone, "Using XML To Share Offline Simulation Data", Proceedings of the Summer Computer Simulation Conference, July 2000.

Dismounted Simulation & Acquisition System (DSAS)

PROJECT FY01-00-06

Client

Project Manager (PM) Soldier
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22060-5852. (703) 704-3816, (DSN: 654-3816), bjette@pmsoldier.belvoir.army.mil

Executive Summary

This project will leverage the current Land Warrior Training Initiative (LWTI) effort into a test-bed for evaluating graphic user interfaces (GUI) as they are developed for the Land Warrior system. As a simulation-based acquisition tool, this will allow for immediate evaluation of GUI compatibility with soldiers prior to embedding the software onto the Land Warrior system.

By providing a dynamic link while maintaining separate architectures for the Delta Force and Land Warrior software, this project will produce a simulation that can provide analysts and soldiers immediate feedback on usage and compatibility issues within the Land Warrior GUI.

Background

The Project Manager Soldier (PM Soldier) is developing a new soldier system called Land Warrior. It is an integrated system that combines the soldier's weapon, helmet assembly, protective clothing and individual equipment, and radio using a computer and software. TRAC-Monterey recently modified the COTS software, Delta Force 2 by NovaLogic INC., for use as a training simulation. The main intent of the LWTI was to exercise the visual and situational awareness of the soldier within a computer environment that integrates several new aspects of the Land Warrior system.

Feedback on the GUI from the testing of the Land Warrior system at the JCF-AWE is still being evaluated. Modifications to the current GUI and new GUIs have been recommended. These new GUIs and modifications can be evaluated in a simulation environment.

Problem Description

While modifications to the GUI are relatively easy to make, deploying these modifications to the Land Warrior hardware is time-consuming, costly, and difficult. Due to the limited number of hardware systems, it is not economically feasible to constantly embed the latest GUI modifications directly onto the Land Warrior systems in order to evaluate the changes. A solution to this problem is to provide a simulation platform for testing and evaluation purposes.

Technical Approach

The research team will utilize the progress made in the initial DSAS project to provide the required simulation platform for testing and evaluation purposes. By providing the required variables from the LWTI simulation in an open architecture Dynamic Link Library (DLL), modified GUI software can easily be connected to the LWTI simulation. This will provide an evaluation test-bed for the Land Warrior interface.

As new or modified Land Warrior GUIs are produced, they can be "dropped" into the LWTI simulation and launched immediately due to the "plug-and-play" nature of the DLL.

Milestones
- Documented DLL (December 2000). The contractor will provide a detailed description of the DLL and variables available to the Land Warrior GUI.
- Simulation evaluation (February 2001). The research team will test several Land Warrior GUIs that are developed by other contractors.
- Technical Report (April 2001)

Deliverable
- COTS software with modified GUI
- Technical Report.

Research Team
- MAJ James E. Illingworth, TRAC-Monterey (lead)
- LTC Jeffrey A. Appleget, TRAC-Monterey
- Kerry Allen, NovaLogic Systems, INC.

Simulation Utilities (SimUtilities)

Project FY01-00-17

Client

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Point of Contact: LTC David Vaden
DSN 680-5954.

Executive Summary

This AMIP (Army Model Improvement Program) project will identify, locate, document, and prototype terrain and other simulation utilities. This project was inspired by the Numerical Recipes text that provides coded examples of important numerical methods. A partial list of utilities under consideration includes creating 2D contour maps from elevation data, calculating ground distance over an elevation surface, finding the best (shortest distance, least time, etc.) movement paths over terrain, and generating pseudo random numbers and random variates.

The project will produce a re-usable library of simulation utilities that are well documented, prototyped and tested. This work supports two primary DoD M&S objectives by contributing to a common M&S technical framework and by contributing to an M&S infrastructure to meet developer and end-user needs. A set of standard, re-usable simulation utilities also reduces VV&A costs.

Background

This project builds on the Fiscal Year 1999 Modular Terrain (ModTerrain) AMIP project. ModTerrain provided a standard application programmer's interface (API) for terrain representation in entity level computer generated forces (CGF) simulations. That API supports a few standard high level algorithms like geometric intervisibility (LOS) and movement.

This project will seek standards from various sources. Below are three examples.
- Current Standards. U.S. Army Modeling & Simulation Standard Algorithms for Terrain and Dynamic Environment (30 September 1997). This catalog assists model and simulation developers and users by "identifying reasonable and acceptable terrain and dynamic environment algorithms, techniques, and treatments." Algorithms for intervisibility, terrain representations, mobility, and dynamic environment are cataloged.
- Development Efforts. Some of the Joint Mapping Tool Kit (JMTK) functionality can be leveraged directly. The Utility Module provides cartographic functions for datum transformation and coordinate conversions, unit of measure conversions, distance, and heading/bearing calculations. The Analysis Module provides some intervisibility calculations that are independent of terrain format, sensors/environmental effects (point to point and possibly view fan), terrain profiling (along some input direction), and slope analysis (point to point, area gradient).
- Proposed Standards. SEDRIS Spatial Reference Model (SRM) coordinate conversion routines. ModTerrain lower level services used to support its high level services.

Problem Description

While ModTerrain supports a few standard high level algorithms like geometric intervisibility (LOS) and movement, simulations also require numerous basic, lower level utilities. Most of these utilities

exist and some have been put forward as standards, but they are not available in a general, re-usable form. Often the documentation is incomplete and the implementation details are absent. Many have not been implemented in modern computer languages using current software engineering standards.

Technical Approach

The research team will review current standards and other sources such as current M&S development efforts to identify candidate utilities. The team will submit the compiled list of utilities for review by the M&S community. They will then research, document, and prototype each utility in C/C++ and Java. The resulting prototypes will constitute a set of standard API's and a set of re-usable implementations for many simulation utilities.

A partial list of utilities under consideration includes creating 2D contour maps from elevation data, calculating ground distance over an elevation surface, finding the best (shortest distance, least time, etc.) movement paths over terrain, performing coordinate conversion, performing dead reckoning and turn smoothing, and generating pseudo random numbers and random variates. This is not an exhaustive list and the research team will solicit suggestions about what to standardize and where to find it from the modeling and simulation community.

Milestones

The project consists of three distinct phases each culminating with a written product.

- Phase I. Review Standards & Other Sources (November 2000). The research team will review current standards, simulation development efforts and proposed standards.
- Phase II. Community Review (December 2000). The research team will submit a list of potential utilities to the M&S community via mailing lists and reflectors and solicit both comments and other submissions.
- Phase III. Research, Document and Prototype Utilities (April 2001). The research team will document and prototype each utility in C/C++ and Java, and submit the results as a standards nomination.

Deliverables

- Software prototypes in C/C++ and Java
- Standards nomination
- Documentation including a technical report

Research Team

- MAJ Leroy A. Jackson, TRAC-Monterey
- Ms. Shirley Pratt, Consultant
- Mr. David Ward, Rolands & Associates
- Dr. Arnold Buss, NPS OR Department

HLA Warrior/Spectrum Integration (Spectrum)

Project FY01-00-01

Client

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Executive Summary

This is the second phase of the HLA Warrior project completed in FY00. In this phase, TRAC-Monterey supports NSC development of Spectrum 2.0. There are four distinct aspects of this support: HLA Warrior related algorithms and classes, Situational Event Generator implementation, Modular Terrain API integration, and USMA Simulation Weather Interface Module integration.

Background

The Training & Doctrine Command (TRADOC) Analysis Center (TRAC) – Monterey, CA and the National Simulation Center (NSC), Fort Leavenworth, KS jointly researched new computer software technologies and methodologies for re-hosting legacy computer simulations to modern platforms and paradigms. The primary purpose of the research was to investigate and demonstrate the application of advanced technologies for reengineering and re-hosting legacy simulations in support of future combat simulation development. This research re-hosted Janus, a widely used, legacy combat simulation. This research was accomplished in two phases. First, TRAC-Monterey coordinated and led the model reengineering. Baseline reengineering requirements included porting Janus to a high-end personal computer (PC) running Windows NT (WinNT), applying a new modular simulation architecture, rewriting source code using an object-oriented language, developing new graphical user interfaces (GUIs), complying with Distributed Interactive Simulation (DIS) and High Level Architecture (HLA) requirements, and incorporating Janus v6.3 and some Janus v6.88 functionality. The re-engineered model was called HLA Warrior. NSC assumed the lead in Phase II, model integration, that included integrating Operations Other Than War (OOTW) functionality into the re-engineered model called Spectrum 2.0, as well as linking the model to the Army's command, control, communications, computers, and intelligence (C4I) systems. TRAC-Monterey continues to support the NSC's model integration efforts in Phase II.

Problem Description

The Spectrum 2.0 model is being developed using HLA Warrior as the baseline. TRAC-Monterey's primary responsibility is to support the integration of existing Warrior modeling functions into Spectrum, including classes and algorithms as well as providing assistance to the Texas Center for Applied Technology (TCATS) in the development and integration of new modeling functions into Spectrum.

Technical Approach

This project has four phases.

In the first phase the team will provide expertise and code writing skills to Texas Center for Applied Technology (TCATS) in regards to HLA Warrior development, the associated Rational Rose

documentation, and functions and parameters of all required HLA Warrior algorithms in order to support their integration into Spectrum 2.0.

In the second phase the team will code a Situational Event Generator (SEG) with an open-ended Application Programmers Interface (API). The purpose of Situational Events is to generate command and staff actions or orders. When the staff takes action, observers record their performance. These situational events are concisely written statements about various activities that provide situations or problems to the training audience. Once complete the team will work with TCATS to integrate the SEG into Spectrum.

In the third phase the team will work with TCATS to successfully integrate the TRAC-Monterey developed ModTerrain API into Spectrum. The ModTerrain API provides the user with a number of low and high level terrain related services and also enables the user to interchange different run-time terrain representations without significant changes to the simulation source code.

In the fourth phase the team will integrate the Simulation Weather Interface Module (SWIM) into Spectrum. The SWIM was developed at the United States Military Academy (USMA) to simulate weather related effects in the Janus model. The SWIM allows the user to replicate weather conditions in any part of the world and model changes in performance due to the differing weather conditions.

Milestones
- Algorithm integration. (JAN 01)
- Situational Event Generator (SEG) development and integration. (MAY 01)
- Mod Terrain Application Programmers Interface Integration. (JUL 01)
- Simulation Weather Interface Module (SWIM) Integration. (SEP 01)
- Write Technical Report. (OCT 01)

Deliverables
- Source code
- Technical support

Research Team
- MAJ Tedd Dugone, TRAC-Monterey (lead)
- MAJ Leroy Jackson, TRAC-Monterey
- Mr. William Caldwell, Rolands & Associates
- Mr. Harold Yamauchi, Rolands & Associates

References
None

Land Warrior Exercise Data Replay (LW-Replay)

Project FY01-00-18

Client

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Executive Summary

Land Warrior (LW) is a first-generation integrated system for the dismounted soldier. This project will produce a portable graphical replay capability for Land Warrior test and exercise data. The development team will code and integrate open source Java software components to produce a software prototype. The first phase culminates with the completion of the design. The second phase culminates with the implementation of the user interface. In the third and final phase, the interface is connected to a database of events from a Land Warrior test exercise. The customer, PM Soldier, will provide a preliminary database design and notional test data for the design team to use during the initial development. Later, the team will connect the interface to actual data.

Background

Land Warrior (LW) is a first-generation integrated system for the dismounted soldier. Land Warrior is designed to enhance soldiers' lethality, survivability, mobility, command and control and sustainability. The system offers significantly improved communications, computing, night vision, weaponry, ballistic protection and load carrying capabilities.

Through a helmet-mounted display, the soldier can view computer generated graphical data, digital maps, intelligence information, troop locations and imagery from his weapon-mounted Thermal Weapon Sight and video camera. This new capability allows the soldier to see around corners, acquire a target, then fire his weapon without exposing himself to the enemy.

The new LW body armor, like the helmet, provides improved ballistic protection at a reduced weight. The armor includes a modular update plate to protect the soldier against small arms.

LW's weapon subsystem features the Army's Modular Weapon System, an M-16 rifle/M-4 carbine modified by a kit that replaces the front hand guards with standard rails that allow the soldier to mount only those items needed for a particular mission. LW's modular design provides an easy upgrade path to accommodate emerging technologies. The net result is a fighting system that will ensure that tomorrow's soldiers will maintain their fighting edge.

Problem Description

Each soldier in the LW system will have a computer on a local area network and a global positioning system (GPS). LW exercises will be instrumented to capture all network traffic, but PM Soldier has no capability to replay the exercise data for after action review and analysis.

Technical Approach

This project has three phases.

In the first phase the team will (1) research and review open source software components like those under development at the Naval Postgraduate School (NPS) by the Loosely Coupled Components (LCC) research group to assess the underlying design and implementation; (2) mock up the initial user interface design and provide a brief description for each capability on the interface; and (3) complete a preliminary software design documented in Unified Modeling Language (UML) using a visual design tool.

In the second phase the team will (1) code the software prototype alpha version; (2) review the alpha version and code the beta version; and (3) update the software design to reflect the implementation.

In the third phase the team will (1) code the software prototype version 1.0, (2) update the software design to reflect the implementation, and (3) test, maintain and enhance the prototype.

The project will use open source software components like those being prototyped in Java at NPS. One component is an interactive, geo-referenced map and overlay display component. The other is a configurable user interface. These and any other components developed during this project will become part of an open source library of reusable components.

Milestones

Phase I (5 weeks)
- Review Software Components (2 weeks)
- User Interface Design (1 week)
- Draft Software Design (2 weeks)

Phase II (9 weeks)
- Alpha Version (5 weeks)
- Beta Version (4 weeks)

Phase III (13 weeks)
- Version 1.0 (5 weeks)
- Test, Maintain, and Enhance (8 weeks)

Deliverables

- software prototype
- software documentation
- user documentation

Research Team

- MAJ LeRoy Jackson, TRAC-Monterey (lead)
- SFC Chris Augustine, PM Soldier
- Mr. Bruce Allen, Rolands & Associates
- Mr. William Caldwell, Rolands & Associates

References

None

SNAP Submission For HLA DSB DIF (DSB Submission)

Project FY01-99-03

Client

Director, Army Modeling & Simulation Office (AMSO)
Data Standards Category
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Executive Summary

Current simulations do not share scenario data developed by their scenario generation systems. Recent TRAC-Monterey research resulted in the development of a draft standard for simulation scenario interoperability. The standard is called the High Level Architecture (HLA) Dynamic Scenario Builder (DSB). It includes a data interchange format (DIF) developed using the eXtensible Markup Language (XML). TRAC-Monterey will package the standard and submit it through the Army Modeling and Simulation Office (AMSO) Standards Nomination & Approval Process (SNAP) process so that it can become a recognized Army standard in the Army Standards Repository System (ASTARS). The research team shall provide technical support during the SNAP submission and feedback process.

Background

The initial phase of the High Level Architecture (HLA) Dynamic Scenario Builder (DSB) project was successfully completed in 1999. A second phase of the project was planned for FY00. This second phase proposed the implementation of HLA DSB in an HLA-compliant NT-based constructive simulation based on Janus called HLA Warrior developed by TRAC-Monterey. HLA Warrior has the ability to import and export Janus scenarios. It could have been evolved to become an HLA DSB-compliant simulation by adding scenario input and export routines that manipulate the HLA DSB standard's XML files. The work would have been accomplished using Commercial Off-The-Shelf (COTS) XML parser routines. However, minor modifications to the HLA Warrior source code would have been required to add the remaining required routines. The funding to accomplish this second phase was unavailable.

The Combat XXI development team has a requirement to create its own scenario exchange mechanism for the new Combat XXI simulation. The Combat XXI team has decided to utilize the HLA DSB work that was accomplished thus far and implement HLA DSB for the Combat XXI simulation. TRAC-Monterey analysts have worked closely with the Combat XI team to aid in the implementation of HLA DSB into Combat XXI.

Problem Description

Current simulations do not share scenario data developed by their scenario generation systems. As simulations continue to be networked together as part of the High Level Architecture (HLA), simulation scenarios must be reentered by hand or are created from scratch rather than reusing existing scenarios.

Technical Approach

The TRAC-Monterey research team will package the High Level Architecture (HLA) Dynamic Scenario Builder (DSB) eXtensible Markup Language (XML) Data Interchange Format (DIF) and submit it through the Army Modeling and Simulation Office (AMSO) Standards Nomination & Approval Process (SNAP) process. When accepted, it will become a recognized Army standard for exchanging scenario data and it will be included in the Army Standards Repository System (ASTARS). The team will provide technical support during the SNAP submission and feedback process.

Milestones

- Package HLA/DSB DIF and deliver in electronic format to the AMSAA POC (29 December 2000)
- Input to SNAP (15 January 2001)
- Support SNAP submission and feedback process for eventual inclusion into ASTARS (January to March 2001)
- Document the results of the entire activity in TRAC-Monterey technical report format including a copy of the SNAP submission (March 2001)

Deliverables

- HLA/DSB DIF submitted through SNAP
- Technical report documenting results of the entire SNAP process

Research Team

- MAJ Tedd Dugone, TRAC-Monterey
- Mr. Lee Lacy, Dynamics Research Corporation (DRC), Orlando, FL

References

- Lacy, L., T. Dugone, and G. Stone, "High Level Architecture (HLA) Dynamic Scenario Builder (DSB) Technical Report", September 1999.
- Lacy, L., T. Dugone, and G. Stone, "XML Data Interchange Format Standards for HLA-Related Data Interoperability", Proceedings of the Southeastern Simulation Conference, 1999.
- Lacy, L., T. Dugone, and G. Stone, "Sharing HLA Scenario Data". Proceedings of the Fall '99 Simulation Interoperability Workshop, September 1999.

U.S./French High Level Architecture Federation (U.S./French HLA Federation)

Project FY01-00-15

Client

Headquarters, U. S. Army TRADOC Analysis Center (TRAC)
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Executive Summary

In November 1998, TRAC-Monterey agreed to participate with the French in a High Level Architecture (HLA) exercise as part of the DEA-F-1200 exchange agreement. The project follows the standard Federation Development and Execution Process (FEDEP) Version 1.4 step by step. The project has two phases. Participants agreed to fund Phase I and seek funding for Phase II. Phase I concluded in November 1999 with the completion of a majority of the first three steps of the FEDEP. Phase II completes the remaining steps of the FEDEP including both co-located and cross-continent federation execution. Phase II culminates in June 2001 with DMSO HLA certification for all federates.

Background

The reusable HLA federation created from this project will be the first HLA federation created at TRAC-Monterey and serve as a platform for developing and testing future HLA projects undertaken by TRAC-Monterey.

The HLA federates involved in the project include:

- HLA Warrior (U.S.): A high-resolution simulation of military combat operations. The HLA Warrior project re-hosted Janus on a personal computer (PC) running the Windows NT operating system and re-engineered Janus as an object oriented, distributed simulation. Spectrum 2.0 development will add non-combat military operations and C4I interfaces to HLA Warrior.
- ELYSA (France): An air defense application developed in the French HLA ESCARDE simulation development environment. Its primary purpose is to model air defense engagements. Since ESCARDE is a full simulation support environment, HLA compliance for ELYSA will support HLA compliance for all simulations developed in ESCARDE with significant direct code re-use.

Problem Description

A U.S. team led by TRAC-Monterey and a French team from DGA/CAD (the Center for Defense Analyses) and will continue to work through the HLA FEDEP process as part of Phase II of a U.S./French project to create a reusable HLA federation.

The overall goal of the project is to demonstrate the ability to federate French and U.S. simulations across-continent via a global communications network, using the HLA standard. Other goals include investigating HLA data collection and analysis techniques, completing DMSO HLA compliance certification, and capturing and documenting lessons learned.

Technical Approach

The second phase of this project has four tasks.

- In the first task the team will develop and implement a software interface between the RTI and HLA Warrior to accommodate selected RTI services and exchange necessary data elements contained within the Federation Object Model (FOM). The smallest set of RTI services necessary to accomplish federation will be implemented. RTI version 1.3 NG will be used for federation implementation.
- In the second task the team will integrate and test the HLA Warrior with the French federate ELYSA via the RTI prior to federation execution. A successful test will confirm whether the required data is being passed between the federates, that time management is implemented correctly, and that bandwidth and latency issues are addressed.
- In the third task the team will implement and execute the HLA federation. Successful implementation of the federation while co-located will be accomplished before attempting to federate across continents via a global communications network. Following a successful co-located federation execution, a dedicated line of communications will be secured for the cross-continent implementation. The federation will also undergo HLA compliance testing as part of task three in order to receive DMSO HLA certification.
- In the fourth task the team will analyze and document the results of the federation execution. The team will determine reusable federation products and deposit those products in the various public data repositories for potential reuse by other M&S federation developers. Lessons learned will be thoroughly documented and changes to recommended federation development processes will be furnished to proponents of those processes.

Milestones

- Develop and implement RTI interface for federates
- Federation integration and testing
- Federation execution and compliance testing
- Analyze results and prepare documentation

Deliverables

- Repeatable and reusable HLA federation
- HLA compliance certification for the federation
- Technical report, documented lessons learned about the FEDEP, HLA certification process, HLA data collection and analysis, and cross-continent federation techniques

Research Team

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- MAJ Leroy Jackson, TRAC-Monterey, (831) 656-4061 (DSN 878), jacksonl@trac.nps.navy.mil
- Mr. Galen Aswegan, Tapestry Solutions, Inc.

References

- Igarza, J. and T. Dugone, "The WARRIOR/ELYSA Experience: A FEDEP Use Example", 2000 Spring Simulation Interoperability Workshop (SIW), Orlando, FL.

Acquisition Center for Research and Lessons Learned (AcquisitionCENTRALL)

PROJECT FY01-00-05

CLIENT

Acquisition Career Management Office, ATTN: SAAL-ZAC,
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Executive Summary

The Acquisition CENTRALL virtual center is an internet-based system. Utilizing the capabilities and modern technology associated with the internet, Acquisition CENTRALL is a central repository of information that facilitates learning among members of the acquisition community. It links the knowledge resources of the acquisition professionals with the research resources of those who study acquisition. Through Acquisition CENTRALL, acquisition professionals submit lessons learned, good ideas, and research topics that need further study for resolution. These submissions reside in the Acquisition CENTRALL database, which will enable several benefits to be achieved. First, as the number of submissions grows, this database will represent a catalog of "high-payoff" targets that will focus acquisition research efforts. Second, this database will facilitate knowledge sharing in that it provides a way for acquisition professionals to disseminate their lessons, ideas, and issues to other practitioners. Third, users who are reviewing a lesson, idea, or issue in the database can provide comments or responses, which allows for productive dialogue and discussion within the acquisition community. Acquisition CENTRALL will also serve as an on-line repository for products such as research papers, student theses, and other study project results. Readers of these products may provide comments or responses that become addenda to the products.

Background

The Army Acquisition Corps (AAC) did not have a formal capability in place to capture lessons learned, techniques or procedures derived from acquisition operations. Through the capabilities of the Internet, a virtual research and lessons learned capability, known as the Acquisition Center for Research and Lessons Learned (Acquisition CENTRALL), has been created. Acquisition CENTRALL is the result of efforts by the TRADOC Analysis Center-Monterey (TRAC-Monterey), the Naval Postgraduate School (NPS), the Center for Army Lessons Learned (CALL) and the Acquisition Career Management Office (ACMO). TRAC-Monterey was responsible for designing and creating the web-site, as well as the ongoing functionality improvements and maintenance. NPS provides completed research in the form of theses and a subject matter expert to review submitted research and lessons learned prior to posting on the web-site. The CALL will host an acquisition cell dedicated to the collection of acquisition lessons learned. Finally, the ACMO will oversee all operations related to the collection of research and lessons learned, dedicate two Army Acquisition Workforce personnel to the CALL beginning in FY01 and provide funding for the completion of all tasks defined in the statement of work and memorandum of understanding between the agencies mentioned above.

Problem Description

The defense acquisition community within the Department of Defense lacks tools, processes, and procedures for capturing and disseminating has a concern that past "lessons learned" in the acquisition process are not being captured and disseminated among acquisition personnel. Because little explicit attention is given to investigation of these "to "lessons learned" in acquisition. In particular, it is

difficult to assess the extent to which lessons may or should be applied in various certain situations. Further, in the current defense acquisition environment, practitioners do not have the opportunities, resources, nor incentives to reflect upon, assess, and report on their experiences. Finally, no current effective mechanism exists for understanding and communicating research needs of acquisition practitioners and policy-makers.

In order to reduce the number of reoccurring negative lessons learned, and to enhance the development and dissemination of acquisition lessons learned "success stories", the acquisition community needs new resources. This project would like to develop a central web-site for their personnel to view past lessons learned in the acquisition process. Both positive and negative lessons learned posted to a central location will benefit the acquisition community. A central web-site will contribute to "organizational learning" (Argyris and Schon, 1978), thereby improving the acquisition process by identifying costly mistakes and providing positive guidance to current practitioners.

A secondary focus of this work will be the displaying of theses by Acquisition students and possible research topics identified by the Acquisition community. Posting theses research to the web-site gives visibility to the research already conducted by previous students.

Technical Approach

This research will be accomplished in two phases. The first phase is the development of the web-site. The web-site architecture must include the ability to:
1. Store numerous documents for retrieval;
2. Ease of use by the internet user; and
3. Ability of Acquisition Students and personnel to submit lessons learned, theses, and possible research topics for posting to the Acquisition CENTRALL web-site.

The second phase will be the management of the document repository by NPS (Dr. Snider), and web-site maintenance by TRAC-Monterey. Submissions to the document repository will be reviewed and approved for publishing on the Acquisition CENTRALL web-site by NPS. This is an ongoing event.

Milestones

• Acquisition CENTRALL Web-site Design. This entails the web-site architecture development and posting to the Internet.
• Review and Approval of submissions for posting.
• Web-site maintenance.
• Write technical report.

Deliverables

• Acquisition CENTRALL Web-site.
• Submission Review and Posting.
• Technical Report.

Research Team

• CPT Scott T. Crino, TRAC-Monterey (lead)
• MAJ James Illingworth, TRAC-Monterey

Re-engineering Distance Learning War Games for the Air War College (DLWG4AWC)

Project FY01-00-20

Client

United States Air Force Air War College
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Executive Summary

The Air War College at Maxwell AFB uses three legacy war games for resident instruction and distance learning. TRAC-Monterey will re-implement these war games in a single application that runs on a personal computer with the Microsoft Windows operating system. A Naval Postgraduate School (NPS) graduate student will re-engineer and prototype one wargame. A contractor, assisted by a TRAC-Monterey analyst, will implement the remaining games. TRAC-Monterey will deliver and demonstrate the war games for the client.

Background

CHEX, CAMPEX and RECEX are discussion war games. Each game is a stand-alone simulation played by a group of students. Each member of the group can play the game on his computer and compare results with the group. The three programs use a similar interface. Each game is a stand-alone application; there is no interaction between students via a network. RECEX and CAMPEX require more computer interaction than CHEX. CAMPEX requires more time to learn and successfully execute than RECEX and CHEX. RECEX and CHEX contain one lesson each while CAMPEX consists of three lessons.

CHEX is a microcomputer-based simulation that is used for teaching the need to carefully coordinate the instruments of national power to achieve national objectives. Instruments in CHEX are political, economic, and military. CAMPEX (Campaign Planning Exercises) is a software system designed to give students the opportunity to tie together their understanding of strategy, leadership, international security, unified commands, and joint fundamentals. The CAMPEX system consists of two modules: "Deployment" and "Employment". The students first deploy joint forces and then employ those forces. RECEX teaches lower level employment tactics.

Problem Description

Computer based military education and training programs that have been in use since the 1980's have become severely antiquated. While sound in principal and meeting their original training objectives, these programs are not flexible and do not allow for the integration of current technologies. The Air War College at Maxwell AFB uses three legacy war games for resident instruction and distance learning. They would like to re-implement these war games in a modern computer language, run then on a PC platform that will be more flexible and user friendly, and allow for distribution of results over the Internet.

Technical Approach

TRAC-Monterey will convert these war games so that they execute as a single application on a PC running the Microsoft Windows operating system. An NPS Computer Science student, supervised by an NPS professor, will analyze the current code, design an architecture and prototype one war game. A contractor, assisted by a TRAC-Monterey analyst, will implement the remaining war games. Upon completion TRAC-Monterey will conduct a demonstration for the client.

Milestones

I. Analyze requirements, examine literature, conduct preliminary research.
II. Implement selected components for CAMPEX Employ prototype
III. Demonstrate CAMPEX Employ prototype
IV. Enhance, test, validate, and document CAMPEX Employ
V. Implement CHEX, CAMPEX Deploy and RECEX
VI. Demonstrate the prototype

An NPS graduate student supervised by a Computer Science Professor will complete phases I, II, and III. A contractor will complete phases IV, V, and VI. TRAC-Monterey will assist and coordinate their work.

Deliverables

- Re-implemented application containing CAMPEX (Deploy & Employ), CHEX and RECEX.
- A demonstration of the software.
- A user tutorial for the software.
- A student thesis to document the project.

Research Team

- MAJ Leroy A. Jackson, TRAC-Monterey
- Antonis Chalakatevakis, NPS graduate student
- Dr. Man-Tak Shing, NPS CS Department
- Rita Kang, Rolands and Associates (NPS support contractor)
- CPT Scott Crino, TRAC-Monterey

References

The Air War College has provided user guides, documentation and source code.

V. Unfunded Research

Movement Planning in Urban Environments (Footprint2Pathfidner)

Project FY01-01-02

Client

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Executive Summary

This project will support Computer Generated Forces (CGF) development and will focus on incorporation into OneSAF through the COMBAT XXI platform. OneSAF and COMBAT XXI will be used in the future to support operational analysis of the Future Combat System (FCS) and to train the Objective Force. Potential also exists for incorporation of these algorithms into decision making tools for command and control. Algorithms will be developed for characterizing urban footprints, assessing structural damage including rubble in urban terrain subjected to conventional weapons attack, and determining routes through the urban environment with consideration for engineer effort required to remove obstructions and risks posed by potential threat forces. This research will accelerate Army M&S efforts in focus areas for logistics, cognitive modeling, and MOUT (Military Operations in Urban Terrain) by producing algorithms that incorporate factors for cognition with regard to logistics (route assessment/planning). Algorithms for damage assessment of different types of structures subjected to a typical threat weapon data set will be established using structural response calculations and experimental and historical data. Probabilistic algorithms will be explored for quantifying rubble based on structural response to weapons effects.

Background

The US Army is being deployed in peacekeeping roles throughout the world and is operating in new and sometimes adverse urban settings. This trend is likely to continue in the foreseeable future and the urban environment will remain a likely area of operations for the Future Combat System and the Objective Force. With these types of geopolitical deployments come the responsibility and necessity for developing sound doctrine for urban warfare. Current urban warfighting doctrine is determined through training exercises at MOUT facilities in the U.S. or during real-world deployments. These exercises and missions produce valuable information for deployment requirements and doctrine development but are expensive to resource and execute, especially for mounted units using equipment currently in inventory. Simulation will be required for doctrine development of conceptual equipment such as the FCS and organizations such as the Objective Force.

Current state-of-the-art technology offers the ability to develop doctrine through the use of modeling and simulation (M&S) platforms such as ModSAF that support multi-echelon warfighting scenarios. The newest emerging simulated warfighting environments such as COMBAT XXI and OneSAF will allow opposing forces to engage and fight with operator-in-the-loop scenarios and experiment with new tactical doctrine using conceptual equipment and organizations. These experiments are developed in an environment that presents the users with real life operational situations and allow the user to evaluate the applied doctrine. Each operation can be conducted numerous times in the simulated environment until the best techniques are developed. The interaction between the simulated environment and user

should be at a level that allows users to modify operations on the battlefield as they see fit. As the future battlefield will most likely contain complex urban settings, emerging simulations will have to model these environments at a much higher fidelity and resolution than is currently available.

Problem Description

Cognitive or situational awareness modeling and human factor performance is lacking in many areas of the warfighting M&S environment. Maneuvering through urban terrain with the ability to recognize urban operational situations as they occur is limited and simple in design and application in current M&S. The ability to determine the effects of conventional weapon attack on an urban terrain is lacking and the ability to recognize obstacles and make complex decisions for alternative maneuvers around obstructions is all but absent. With these very critical concepts missing from the simulated warfighting environment, it is difficult to evaluate the effectiveness of new urban tactical doctrine or realistic consequences of battlefield decisions.

Technical Approach

The approach involves three major tasks, each producing fundamental algorithms needed for portrayal of MOUT in M&S: urban footprint characterization, structural damage footprint characterization, and pathfinder algorithms. The urban footprint characterization effort will involve determination of typical urban landscapes and methods and materials for construction. This information will be used in the structural damage effort. The pathfinder algorithm will use the results of structural damage footprint characterization.

The structural damage assessment model will predict damage and the associated debris from an attack of conventional weapons on the urban area. Algorithms will be developed for the damage assessment of typical structural types and construction materials (e.g., concrete) subjected to a limited set of conventional weapons. The algorithms will be developed based on structural response calculations and experimental data. Probabilistic algorithms quantifying rubble from structural debris will be developed based on structural response to weapon effects. The algorithm developments will directly feed into the mobility models for maneuver over structural debris and rubble in urban terrain and for damage assessment simulation models of fixed facilities on the battlefield including urban areas.

The pathfinder model will determine GO and NOGO areas through an urban environment, incorporating urban restrictions, structural debris, consideration of engineer effort to reshape routes, and incorporation of threat potential. Both the GO and NOGO areas will be determined by the location of structures and buildings and will consider urban terrain attributes such as path width, military load classification of bridges, and other restrictions to vehicle movement. In the GO area predictions, new algorithms will be developed to determine the ability of a vehicle to override non-standard obstacles created from the effects of collateral damage from conventional weapons attack.

Threat assessment will consider the different threat fields and risks for use in determining routes through or around threat areas. Examples include threat identification, available weapon systems and effective ranges, enemy occupied areas or suspected observation posts, and methods or techniques for carrying out a threat. Engineer assessment will evaluate the engineering effort required to clear necessary corridors through urban areas cluttered by debris.

The operation of the urban evaluation model will follow general sequences that involve the evaluation of different levels of situational awareness and human factors. An example of the steps required to conduct an urban evaluation follows:

- Divide an urban environment into a grid system of GO (streets, alleys, avenues, and roads) and NOGO areas (buildings and structures) of varying levels of trafficability, or using existing digital terrain make GO and NOGO trafficability predictions based on terrain attributes and specific unit capabilities.
- Calculate levels of trafficability through GO areas based on size/shape of rubble, path width, bridge classification, path construction materiel, and overhead restrictions.
- Assemble or infer data on structures contained in NOGO areas. This data will be used to calculate structural damage and to model rubbling effects or encroachment into GO areas.
- Determine areas of risk within the urban terrain due to the threat such as low risk/possible threat observation, high risk/enemy occupied area with anti-tank weapon systems.
- Maintain database of user vehicles that may be used containing vehicle characteristics.
- Calculate acceptable routes between points, given a convoy composition.
- Calculate a cost for acceptable routes. Cost factors include time for the slowest or most burdensome vehicle within the convoy and time required for removal of obstacles.
- Associate a distance and speed with acceptable routes.
- Associate a threat risk level with acceptable routes. The highest risk level for any GO area on the route determines the risk level for the entire route.
- Filter/rank all acceptable routes.

The ERDC has experience working in all technical areas mentioned in this proposal. The Topographic Engineering Center (TEC) has produced and continues to produce digital terrain databases. The Geotechnical and Structures Laboratory has subject matter experts with years of experience working with conventional weapons effects against structures and vehicle mobility. TRADOC Analysis Center-Monterey (TRAC-Monterey) has expertise in M&S development and concepts analysis and will support development of the structural damage footprint and pathfinder algorithms. The NATO Reference Mobility Model (NRMM), developed within the ERDC, will be used in the formulation of the pathfinder and rubble override algorithms.

Proposed model enhancement: This proposed research would address the near and far term technology voids in logistics and cognitive behavior modeling as well as MOUT. MOUT is a key technology factor in the Objective Force. The development of algorithms for assessing structural damage in urban terrain including the encroachment of structural debris into possible mobility corridors will assist Army M&S in the areas of lethality calculations and in mobility predictions where rubble is created in the urban terrain. All three M&S domains will benefit from the development of this advanced modeling capability.

Milestones (Assumes 1 October 2000 start)
- Develop necessary engineering-level urban terrain data sets. (1QFY01)
- Define mobility path search hierarchy. (1QFY01)
- Define threat level hierarchy. (1QFY01)
- Determine the level of structural detail available through the urban characterization model and categorize types of structures. (1QFY01)
- Define engineering assets. (1QFY01)
- Define data formats for inter-linked models. (2QFY01)
- Implement path search processes. (2QFY01)
- Create database for threat level assessment. (2QFY01)

- Identify existing experimental or historical data on conventional weapons against urban environments. (2QFY01)
- Create database for engineering requirements. (2QFY01)
- Conduct structural response calculations to determine the damage to structures and the debris produced from structural damage. (3QFY01)
- Conduct model verifications. (3QFY01)
- Compile structural damage data and debris footprints for the structure types. (4QFY01)
- Integrate models into COMBAT XXI and verify results. (4QFY01)

Deliverables
- Route selection algorithms
- COMBAT XXI revision
- Final Technical Report

Research Team
CPT Scott T. Crino, TRAC-Monterey (Lead)
Dr. Niki Deliman, WES
MAJ Leroy A. Jackson, TRAC-Monterey

References
None

Simulation Capabilities for Military Operations in Complex Terrain (SIM4MOCT)

Project FY01-01-03

Client

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Executive Summary

One of the most important areas of military simulations is full-spectrum military operations in complex terrain, particularly, military operations in urban terrain (MOUT). Yet most simulations do not represent military operations in complex terrain well. This project will research the use of volume pixels to support urban terrain modeling, develop a prototype to demonstrate volume pixel technology, and submit results to AMSO as standard nominations.

There are two major challenges to representing MOUT in military simulations. The first relates to terrain representation. MOUT is characterized by a wide variety of cultural features that must be represented in detail. The second challenge to modeling MOUT is the complexity of interaction between entities and the terrain.

This research will provide direct benefits to future M&S applications such as OneSAF and COMBAT XXI. Specifically this research will support OneSAF's requirement to model urban terrain using latest technologies. Also, COMBAT XXI will benefit from the detailed capabilities of volume pixels to support analysis requirements. It also provides potential benefits to legacy simulations, since the deliverables will be reusable in existing simulations. This research also supports standards development in several Army standards categories including Computer Generated Forces (CGF), Terrain, and Object Management.

Background

This project will research the use of volume pixels to better model buildings and interior spaces. Volume pixels are a collection of three-dimensional boxes arranged to represent physical structures. While the use of volume pixels has been deferred from serious consideration in terrain representation, they offer potential for providing three-dimensional structures with interior representation. This allows for interior volume rendering of the structure within a coherent scheme. They also provide for physics based modeling of the structures themselves and the potential to effectively represent the effects of close combat and weapons of mass destruction on structures.

Volume pixels can be structured so that each pixel has a unique XY coordinate address, and then has an indefinite number of horizontal (Z coordinate) addresses, each identified by upper and lower limit Z coordinates. Each pixel also has an associated value for the construct or content of that space (i.e. water, wood, masonry, air, etc.). The address pattern should have the flexibility to add additional volume representations by identifying new Z upper and lower address coordinates, and add another value for content. For example, when munitions impact a masonry volume pixel (VP), a portion of the previous VP is identified by a new Z address, splitting the previous VP, and a new content value (air) is identified. This provides three VPs where there was previously one, consisting of masonry, air, and masonry VPs.

The construct of VP XY coordinates allows for the grouping of VP's, i.e., a 10 cm square VP could be subdivided into 16 (4X4) subordinate VPs, for the purpose of reducing the number of VPs which must be compared for ray traces in line-of-sight (LOS) calculations. It is appropriate that the instantiation processes of terrain data bases allow for the establishment of both the size of the detail level VPs and the composition/grouping of the superior VPs.

Grouping allows for the use of VPs for the complete structure of a building, surface to ceiling, with various VP Z segments representing foundation, floor, air volume, ceiling, floor structure, floor facing for next level, etc, until the structure roof is provided. The use of VPs allows for dynamic terrain and the creation of hasty structures (i.e., sandbag walls, rubble piles) from destroyed buildings, and may also have utility in the representation of other feature data where composition differences at various levels/heights exist.

Problem Description

Operations in complex terrain have increasingly become the site of military operations. The complexities of the urban environment such as line-of-sight restrictions, abundant cover, limited intelligence, dense cultural features, and the presence of non-combatants challenge military operations. To achieve success in future conflicts involving complex terrain, U.S. forces must possess overwhelming technology advantages in an urban environment. Modeling and simulation in an urban environment will support training in an urban setting.

Existing simulations such as Modular Semi-Automated Forces (ModSAF), Close Combat Tactical Trainer (CCTT) SAF, Battlefield Environment Weapon Systems Simulation (BEWSS), Interactive Tactical Environment Management System (ITEMS), the Joint Conflict Model (JCM), the Joint Training System (JTS), CASTFOREM, and Janus have varying degrees of representation and support for MOUT.

Research is required to better represent buildings and other physical structures in terms of interior spaces or three-dimensional representation. Polygon representation is the current standard for visually rendering terrain and other features. While polygons are sufficient for most applications, they fall short in providing an interior space within buildings for the utilization of human representation and behaviors within the building. They also lack support for physics based effects modeling, since they do not represent various surface and subsurface structures inherent in building construction.

Technical Approach

Overview. Two major challenges exist in representing MOUT in military simulations. The first relates to the terrain representation. MOUT is characterized by a wide variety of different cultural features and these features must be represented in great detail. The second challenge in representing MOUT in military simulations is the complexity in the interaction of entities with the terrain and with each other. The set of interactions between entities and terrain is complex. A key aspect of any successful new approach will be the ability to present the widest possible range of relationships.

One key to solving the terrain representation problem lies in applying volume based pixels to a polygonal database. The ability to design a polygonal structure constructed with volume pixels will allow the most accurate representation of cause and effect on man made and natural structures from weapon systems. The cause and effect relationship will be based on a thorough literature review of existing terrain representations and current doctrine.

Milestones

Phase I - October 2000
Phase II - June 2001

Deliverables

- Phase I. (1) literature review, (2) description of the problem, and (3) submission for proposed standard of process using volume pixels on a polygonal terrain database.
- Phase II. (1) description of standard and submission to AMSO standards and (2) code prototype rendered on SEDRIS database and WURTS Philadelphia database buildings.

Research Team

- CPT Scott T. Crino, TRAC-Monterey (Lead)
- LTC Jeffrey Appleget, TRAC-Monterey

References

- FM 90-10 Military Operations on Urbanized Terrain (MOUT)
- TRADOC FY01-07 Command Plan
- CALL Newsletter 99-16

Land Warrior Immersion Trainer (LWIT)

PROJECT FY01-01-04

Client

Project Manager (PM) Soldier, Fort Belvoir, VA.
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Executive Summary

This project will leverage the current DSAS effort into an evaluation of Commercial-Off-The-Shelf software as a possible immersion trainer for the Land Warrior system. As an Army Transformation effort, the LWIT will allow soldiers to embed the software directly onto the Land Warrior system and utilize it as a training tool.

By providing a simulation environment directly embedded in the Land Warrior hardware, soldiers can practice utilizing the Land Warrior interface while using the original Land Warrior equipment.

Background

The Project Manager Soldier (PM Soldier) is developing a new soldier system called Land Warrior. It is an integrated system that combines the soldier's weapon, helmet assembly, protective clothing and individual equipment, and radio using a computer and software. TRAC-Monterey recently modified the COTS software, Delta Force 2 from NovaLogic INC., to serve as a training tool. The main intent of the training tool was to exercise the visual and situational awareness of the soldier within a computer environment that integrates several new aspects of the Land Warrior system.

With the testing of the Land Warrior system at the JCF-AWE complete, PM Soldier is interested in pursuing development requirements for an embedded trainer based on the Operational Requirements Document (ORD). With the efforts of the DSAS successful, PM Soldier would like to reuse the gains made by the DSAS project to evaluate the feasibility of using the LWTI simulation as the embedded trainer.

Problem Description

The Land Warrior ORD requires an embedded trainer and PM Soldier is evaluating several efforts to satisfy this requirement. While several aspects of the embedded trainer may be beyond the capabilities of the current hardware technology, PM Soldier is interested in testing and evaluating a proof-of-principle embedded trainer based on the LWTI work and the Delta Force COTS software.

Technical Approach

The research team will utilize the progress made in the initial DSAS project to provide the required Land Warrior embedded trainer proof-of-principle. Using the current Delta Force software developed for the DSAS, focus of the research team will be to integrate the simulation as an embedded trainer on the Land Warrior hardware.

As new or modified Land Warrior GUIs are produced, they can be "dropped" into the LWTI simulation and launched immediately due to the "plug-and-play" nature of the DLL.

Milestones

- Hardware testing and evaluation (Two months after contracted). The contractor will provide a detailed description of acceptable hardware for the embedded trainer.
- Implementation of embedded trainer software on a development platform (Five months after contracted). The research team will test the embedded trainer software on a development platform
- Embed and test trainer on Land Warrior platform (Six months after contracted).
- Technical Report (Eight months after contracted).

Deliverable

- Results of testing and evaluation of hardware to satisfy embedded trainer requirements.
- Results of testing and evaluation of embedded trainer software on development platform.
- Proof-of-principal demonstration of embedded trainer on Land Warrior hardware
- Technical Report.

Research Team

- MAJ James E. Illingworth, TRAC-Monterey
- LTC Jeffrey A. Appleget, TRAC-Monterey
- Kerry Allen, NovaLogic Systems, INC.

Simulation of Clinic Operations (SimClinic)

PROJECT FY01-00-16

Client

Headquarters, U.S. Army TRADOC Analysis Center (TRAC), ATTN: ATRC, Fort Leavenworth, KS 66027. Point of Contact: Mr. Michael F. Bauman, SES, Director, TRAC. DSN 552-5132. baumanm@trac.army.mil

Executive Summary

This project will build an interactive training simulator to for use by mid-level leaders as they prepare to manage an Air Force primary care medical clinic. SimClinic will run on contemporary Windows-Intel personal computers. Training will focus on the decisions and actions of four leadership roles in the clinic: medical director, nurse executive, group practice manager (business manager), and NCOIC. The simulation must give learners the experience of implementing a newly engineered medical practice process, while at the same time successfully providing medical services to thousands of active duty and retired military personnel and their families. This training tool will be used both in formal training settings and through distance learning at DoD clinics. Staff members may also use the tool at their own pace on their own personal computers. SimClinic must provide its users (both as individuals and as leadership teams) with the experience of making decisions and trade-offs that allow their simulated clinic to achieve multiple medical, service, and business practice objectives.

Background

The key to understanding the inside model of SimClinic involves the concept of software agents. The customer wants a simulation that can adapt to the decisions, both wise and unwise, of people learning how to run a clinic. They don't want a rigid tool that returns predictable answers once users make "right" or "wrong" decisions. The simulated clinic needs to present rich behavior that is closely related to the actual sequence of decisions made by a player or group of players. The question is, how do you get a simulation or model to adapt in a rich way to decisions made by users? SimClinic will achieve adaptive behavior through the use a wide variety of software agents.

Each of these agents will be pieces of software that choose how to behave based on their individual goals, their internal condition, and what is going on around them. In fact, as soon as any given agent takes an action, surrounding agents will begin to act in response to that action, and so on. This flexibility and sensitivity could not be achieved with traditional software means. Pages of preconceived logic would either be to simplistic and rigid to produce rich adaptive behavior or too expensive and difficult to debug

Problem Description

The person or team using SimClinic will make decisions and take actions to run their own virtual primary care clinic. They can run the clinic however they choose. But SimClinic will respond to each and every decision to act or take no action. Poor choices will lead to calamity and chaos in the virtual clinic (in this regard SimClinic will be similar to a flight simulator being flown with poor pilot decisions). While there is no single Right Way to run the virtual clinic under all circumstances, clinic leaders who apply Best Practices, pay attention to the feedback provided by SimClinic, and correctly read the demographic makeup of their patient population and community will create an environment where their clinic will operate effectively.

The individual (or group) using SimClinic does not directly control the performance of their virtual clinic or the outcome of a training session. A user could not simply force all patient interviews to take place in less than 15 minutes, for instance. Instead, users control a simulated set of staff members, processes, equipment, and facilities. Users must manage all of these pieces and coordinate their actions in order to run an effective clinic. Equipment and facilities may break or deteriorate. Staff members may not understand what to do or they may misbehave (and require redirection). Processes may be ambiguous or may even conflict with each other. And any of these elements (staff, equipment, processes) may be inappropriate or inadequate for the demand placed on this clinic by the patient community. In practical, concrete terms each SimClinic session must re-answer the question, "How do you run a Primary Care Clinic under THESE conditions."

Technical Approach

SimClinic can be built by a project team of approximately six to eight people (producer/designer, 3-4 software engineers, 2-3 artists and media specialists). With a team of this size and makeup, the product could be built in approximately 18 months. A limited pilot release would be available after approximately 12 months from the start of the project. This release would support classroom use of the simulator to collect suggestions and feedback on the realism of model behavior and assumptions. This feedback could be incorporated in a full production release of the product that would be finished about six months later. At this same time, the project team would release a Beta test version of SimClinic for multi-player support.

Based on a first set of visits, interviews, and observations at real Air Force clinics, SimClinic will support at least the following set of Best Practices, methods, and procedures:
- Scheduling Providers – consistent and long-lead time attention to Provider coverage is critically important to insuring that the right mixes of staff are available for predictable peak operating periods in the clinic.
- Reading clinic population demographics – another key way to predict the volume and type of demand for a given clinic. Without attention to demographics, a reassigned clinic population could swamp the clinic with treatment requirements for which there would be no quick response except to refer patients to outside resources.
- Training based on feedback and use-statistics – service demands change and the skills of staff members must keep up with demand.
- Working with the Community – communicating prevention messages out to the clinic population can add a powerful resource to patient care.
- Triage and other processes within the clinic – users are responsible for making balanced use of the diagnostic and treatment skills of their entire staff. SimClinic users must establish and revise the Clinic procedures that route patients for diagnosis and treatment.
- Criteria for outside referrals – Referrals to outside medical resources influence the economics of clinic operation. Tri-Care reports (and clinic reports, if the medical director chooses to produce them) provide feedback on the types of referrals that might be pulled back into the clinic, given changes in staffing or training. Equipment and facilities may also affect the rate and types of referrals.
- Managing the clinic – a set of general management and crisis management skills will be called for to deal with staff members who get in trouble, patients with a complaint, breakdowns, staff rotation, emergency changes in staff levels, and a host of other problems selected from the real world of clinic operation.

Milestones

- Phase 1.1 – Knowledge Collection; Design: **X+3 months.**
- Phase 1.2 –Enter Alpha Tests: **X+10 months.**
- Phase 1.3 – Limited Beta test: **X+12 months.**
- Phase 1.4 – General release of SimClinic 1.0 (Primary Care Clinic), single player version. Beta release of SimClinic 1.1 (Multi-player version of SimClinic 1.0): **X+18 months.**

Deliverables

- Phase 1.1 – Design: collects expert knowledge, events, calamity descriptions, Murphy's Law input, and both original and off-the-shelf data, analytical, and multimedia materials. Refines the existing Preliminary Design and produces detailed guidelines for programmers and artists. Completes: **X+3 months.**
- Phase 1.2 – Iterative, parallel development of Phase 1 models, human interface, data bases and tables, classes, and software product platform. Enters Alpha Tests: **X+10 months.**
- Phase 1.3 – End of limited Beta test and ready for limited distribution pilot use. Beginning of two month pilot use: **X+12 months.**
- Phase 1.4 – General release of SimClinic 1.0 (Primary Care Clinic), single player version. Beta release of SimClinic 1.1 (Multi-player version of SimClinic 1.0). Release of both releases: **X+18 months.**

Research Team

- CPT Scott T. Crino, TRAC-Monterey (lead)
- Associate Professor John Hiles, Naval Postgraduate School
- LTC Jeffrey Appleget, TRAC-Monterey

Terrain Visualization Toolkit (TerrainVis)

PROJECT FY01-01-05

Client

Headquarters, U.S. Army TRADOC Analysis Center (TRAC), ATTN: ATRC, Fort Leavenworth, KS 66027. Point of Contact: Mr. Michael F. Bauman, SES, Director, TRAC. DSN 552-5132. baumanm@trac.army.mil

Executive Summary

The Army Chief of Staff's vision of the Intermediate Brigade Combat Team (IBCT) is driven by a requirement for a lighter, rapidly deployable, more lethal force. This transformation to a lighter, rapidly deployable force generates requirements for more powerful analysis tools in the hands of warfighters. Terrain analysis is the first step in the development of nearly every military planning cycle. Until recently, the availability of a 3-Dimensional view into the simulated battlefield was on a limited number of high-end graphics computers. Our goals are to investigate methods to develop lightweight tools to quickly and efficiently visualize virtual Digital Terrain Elevation Data (DTED).

This work provides a powerful utility to the warfighter and can also serve as a base line for a tactical virtual planning and analysis tool. This project will also explore extending virtual terrain to the Internet.

This project will leverage existing technologies and resources to develop a virtual terrain visualization tool for the Personal Computer or laptop. Through the exploration of VRML, GeoVRML, and Java-3D a lightweight tool can be developed to view virtual DTED terrain on commonly available hardware/software platforms.

Background

Terrain analysis is critical to operations planning and the first key component of the mission planning cycle. It greatly impacts the deployment of both friendly and enemy forces. Limited resources exist to easily access terrain information for a given location. Today, soldiers generally use paper map reconnaissance to plan their ground operations. If a unit staff wants to visualize the terrain in which they plan to operate, they must walk the terrain themselves, or send a request to the National Imagery and Mapping Agency (NIMA) for a digital model of the terrain in their area of interest. There are no easy-to-use tools available to the warfighter to quickly generate digital terrain model using a desktop PC or laptop.

Problem Description

Technological advances in computer hardware and software have brought 3-Dimensional Visualization of the simulated battlefield within the reach of individual analysts and modelers on relatively common equipment. The 3-D Visualization Utility is an initial approach to making this capability available within Army models as a set of utilities and software templates for users to generate 3-D views of the simulated battlefield during simulation analysis or scenario set up. The spatial data used to fill the templates will be obtained from the combat model wherever possible to maximize the correlation between the simulation's internal representation and the view from the utilities. The first version of the utilities will produce a view of a specified area of terrain and the entities occupying that area for a fixed moment in the simulated timeline.

Simulation scenario developers and analysts have long sought a view into the virtual environment created by their simulations. Until recently the availability of a 3-Dimensional view into the simulated battlefield was on a limited number of high-end graphics computers. Traditional viewers or "Stealth" stations attempt to render the whole scene with all terrain and entities included in real time. Instead the 3-D Visualization Utilities will initially attempt only to render a smaller selected area with a reduced number of entities. No new technology is proposed. Only the full utilization of resources already available by the development of utilities to complete, render, and display the required templates. Admittedly, the better the equipment available is the better the end result will look. Photographic quality is not necessary to resolve most day to day questions. A simple view of the virtual environment is all that is required.

Technical Approach

A prototype for the 3-D Visualization Utilities suite exists which uses data delivered from the Operational Test–Visualization (OT-Vis) tool produced by US Army TRADOC Analysis Center at White Sands Missile Range. The entity types, placement, and a selected portion of the elevation data are extracted from the events log data and are piped into a Virtual Reality Modeling Language (VRML) file template. The VRML is then displayed with a viewer designed to display VRML. This approach is cross platform. The linkage between OT-Vis and the 3D Toolkit is only through the file produced. The snapshot produced can be viewed without OT-Vis. Eventual development could also provide linkages with TRAC-WSMR's CASTFOREM simulation and Combat XXI. Work on developing more detailed templates and template filling algorithms and the use of alternate rendering viewers and file formats is also required. Since most graphics formats are Object Oriented, developing the 3-Dimensional Visualization Utilities as High Level Architecture (HLA) compliant is desirable.

Milestones

- Development of prototype, 2Q, FY 2001
- Development of additional templates and linkages, 3Q, FY2001
- Delivery of enhanced templates, viewer, linkage documentation, 4Q, FY2001

Deliverables

- Prototype
- Enhanced templates, viewer, linkage documentation**.**

Research Team

- MAJ James E. Illingworth, TRAC-Monterey (lead)
- Mr. Damon Baker, TRAC-WSMR
- Dr. Don Brutzman, Professor, Naval Postgraduate School
- Dr. Martin Reddy, Stanford Research Institute

NPS Military Housing Customer Database (Housing Database)

PROJECT FY01-00-07

Client

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Executive Summary

This project will utilize the Master's Thesis requirements to assist the housing activity at the Naval Postgraduate School (NPS). With a requirement to produce a quality product for a Master's Thesis, several graduate students attending NPS will provide a customized database and graphic user interface (GUI) to display housing requirements at NPS. This effort will also assist the housing office with preparing required reports to higher headquarters.

Background

The Naval Support Activity (NSA) at NPS administers military housing at La Mesa Village in Monterey, California, and Army housing at both the Presidio of Monterey (POM) and the POM Annex at old Fort Ord. Residents include service members from all branches of military service attending NPS and the Defense Language Institute (DLI), as well as permanent party assigned to NPS and DLI. The large student population creates a high turnover rate and presents challenges to forecasting future housing requirements.

In a continuing effort to support the housing office with forecasting tools, TRAC-Monterey will develop a database containing customer information necessary to complete the housing application form. The database builds upon previous TRAC-Monterey work to develop housing forecasting tools. TRAC-Monterey provided technical support to develop the housing office's web site that includes an electronic registration form. By completing the registration page, customers can electronically submit application data via e-mail directly to a counselor's email address. Although useful, information in e-mail format is difficult to manipulate or query unless converted to another application. The newly developed database will accept electronically transmitted data directly into the database, eliminating the process of converting e-mail information to a usable form.

Once in the database, information could be queried as necessary to assess housing requirements. The database, in Microsoft (MS) Access format, will also allow the counselors to modify the customer's information and print DD Form 1746 - Application for Assignment to Housing. Future research includes developing a relational database linking maintenance activities and other tracked data with housing assignments. Potential long-range efforts include replacing the existing FAMIS housing database with a relational Access database, and integrating using friendly applications to navigate and modify database fields.

Problem Statement

With large queuing problems for arriving students at NPS at the military housing agency, students routinely wait for housing for two to six months. In an effort to reduce the waiting times for housing, the housing office is trying to forecast arrivals and arrival requirements for government housing.

Technical Approach

TRAC-Monterey will lead development of an MS Access database that accepts electronically submit information from the housing web site. The database will allow housing counselors to automatically produce and print DD Form 1746 - Application for Assignment to Housing. TRAC-Monterey will also provide training to housing counselors on procedures for producing the form from the Access database. TRAC-Monterey will also assist the private contractor tasked to maintain the housing web site with technical advice. Assistance includes recommendations to ensure electronically submitted information that is sent uses necessary protocols and security to populate the Access database.

Milestones

- Develop MS Access relational database (December 2000).
- Complete database housing GUI (February 2001).
- Present Thesis work to Housing Office (April 2001).

Deliverables

- MS Access relational database.
- Database housing GUI.
- Thesis.

Research Team

- MAJ James E. Illingworth, TRAC-Monterey
- CPT Jon Brickey, NPS Student

Non-Lethal Modeling Assessment and Development

Project FY01-01-07

Client

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Executive Summary

This project will synthesize knowledge about non-lethal weapons and mechanisms, identify knowledge and data gaps, and develop conceptual models to represent non-lethal weapons effects against personnel and material targets in combat simulations.

Background

The advances in technology for military weapon systems allow commanders to utilize alternative approaches toward mission accomplishment at the strategic, operational and tactical levels. Recent experiences in Somalia, Bosnia, Rwanda, Haiti and Kosovo represent the military's shift toward more stability and support operations (SASO), where the use of non-lethals is vital in conducting crowd control during peacekeeping and humanitarian assistance missions. The use of non-lethal weapons is not restricted to SASO, however. TRADOC pamphlet 525-73, Concept for Non-Lethal Capabilities in Army Operations, outlines the concept for the use of non-lethal weapons in interdiction of tactical/strategic resources, conflict intervention, counterdrug/terrorist operations, hostage retrieval and military operations in urban terrain (MOUT), as well as, large-scale operations.

Problem Description

The Army must train for the use of non-lethals on the battlefield and capabilities should be incorporated into all appropriate battle simulations. The question of how to model non-lethal weapons effects and human behaviors toward those weapons still remains. How do we develop algorithms to accurately represent weapons effects on a person or group of people, regardless of religion, color, creed or ethnic background? Readiness of the US Army directly ties to the ability to model and simulate current technologies for use in a training environment.

Milestones

TBP.

Research Team

- CPT Scott T. Crino, TRAC-Monterey

TRAC-Monterey Intranet (Intranet)

Project FY01-01-06

Client

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Executive Summary

A modern, information age organization must use automation, computer systems and networks to share information. An Intranet is a set of computers connected by secure, possibly virtual, networks. Potential benefits of an Intranet include enhanced productivity, savings in operating cost, improved customer service, and faster and better access to up-to-date information. Challenges include maintaining security and minimizing costs.

The Army is a learning organization and an Intranet empowers learning organizations because the Intranet is not only a powerful communication medium but also a knowledge base. It has advantages over previous digital knowledge bases in that it more easily captures and handles unstructured and implicit knowledge. TRAC-Monterey will move from a directory and file oriented electronic filing system to an Intranet oriented information management system.

Background

TRAC-Monterey has a local area network of over forty computers and other devices. The primary server has a common directory and public directories for shared files. In addition, users can share directories or files on their local system with other users on the local area network. The TRAC-Monterey domain has connections to the Naval Postgraduate School (NPS) network and domain and TRAC-Monterey users access the Internet through this connection.

TRAC-Monterey has a robust local area network and Internet connection, but also has an aging Internet web site and no real Intranet. An Intranet is (1) a computer network connecting an affiliated set of clients using standard Internet protocols or (2) an IP-based network of nodes behind a firewall, or behind several firewalls connected by secure, possibly virtual, networks.

Intranets should help organization members collaborate on business processes such as product development that create value for the organization and its customers. Specifically, Intranets centralize the business process in an easily accessible, platform-independent virtual space. Successful Intranets allow members from a variety of organizations or departments to contribute the different skills necessary to carry out a particular process. While each department of an organization may have its own virtual space, Intranets should be organized primarily around the business processes they help members carry out, rather than the organizational chart.

Problem Description

The amount of shared information placed on the local server has been growing rapidly. This information is not well organized and it is difficult for anyone to find a particular document. There is no policy that dictates what information is shared on the network and what information is maintained on the user's own system. The TRAC-Monterey Internet web site is large, incomplete and difficult to maintain.

Technical Approach

TRAC-Monterey will use its existing network and web servers to create the Intranet. Users will use web browsers on client machines to connect to the Intranet web server. The TRAC-Monterey Intranet will grow and improve over time. The initial phase will require minimal time and little financial commitment. At the heart of the TRAC-Monterey Intranet is a set of internal databases. Analysts and support staff will use the Intranet daily to access and provide information. Analysts will file project proposals, technical reports, conference papers, trip reports, contract information, white papers, information papers, project updates, and presentations in the internal databases. Support staff will maintain administrative information in the internal databases. Authorized users will access the Intranet with appropriate security anywhere they can establish an Internet connection. While databases will be at the core of the TRAC-Monterey Intranet, the system will also accommodate less structured data.

Security will be maintained by using a secure server, authentication, password protection and physical security for the server machines. TRAC-Monterey will check for links to unsecured locations, backdoors from the Internet to our Intranet, proper use of passwords and use other security mechanisms provided by the Intranet setup. Network security and database design will selectively limit access of information to authorized users. For example, contractors, professors, students and visitors will not have full access to internal TRAC-Monterey information on budgets and contracts.

Milestones

Phase I – Conduct Data Modeling and Initial Prototyping (December 2000)
Phase II –Populate Databases and Write Procedures (March 2001)
Phase III – System Validation and Full Adoption (June 2001)

Deliverables

- Internal Databases
- Intranet Management Plan
- User Guides & Instructions

Research Team

- CPT Dwight Hunt, TRAC-Monterey (Lead)
- CPT Scott T. Crino, TRAC-Monterey
- MAJ Leroy A. Jackson, TRAC-Monterey
- MAJ James Illingworth, TRAC-Monterey

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